The Lepidopterological Society of Japan

蝶と蛾 *Trans. lepid. Soc. Japan* **55** (3): 196–202, June 2004

Immature stages of *Lyonetia euryella* Kuroko (Lepidoptera, Lyonetiidae)

Neung-ho AHN[1], Toshiya HIROWATARI[1]* and Hiroshi KUROKO[2]

[1] Entomological Laboratory, Graduate School of Agriculture and Biological Sciences, Osaka Prefecture University, Sakai, Osaka, 599-8531 Japan
[2] 1-4-3 Mai, Hannan, Osaka, 599-0224 Japan

Abstract Morphology of immature stages of a Japanese lyonetiid moth, *Lyonetia euryella* Kuroko is described. By comparing with *L. prunifoliella* (Hübner), and *L. anthemopa* Meyrick, it is suggested that larval chaetotaxy, pupal frontal horn and its superficial structure, and projected tracheae and spines of 10th abdominal segment are useful for the taxonomy.

Key words *Lyonetia euryella*, Lyonetiidae, Lepidoptera, immature stages, Japan.

Introduction

Lyonetia euryella Kuroko, 1964 is distributed in Honshu and Kyushu, Japan (Kuroko, 1982). The adults occur about 4 times from May to November, and the larvae are known to make linear-blotch mines on the leaves of *Eurya japonica* Thunb. (Theaceae). But no morphological study of the immature stage has been done. The host plant, *Eurya japonica*, an evergreen tree, is widely distributed in East Asia including Japan. In Japan, the branches of the tree are traditionally used in Shinto ceremonies, and also used in horticulture and dyeing (Nagamasu, 1997).

Kuroko (1961) described the morphology of the adult and immature stages of *L. anthemopa* Meyrick, 1936, with ecological notes on this species. Schmitt *et al.* (1996) described the immature stages of *L. prunifoliella* (Hübner, 1796), a leaf miner pest of apple trees. However, morphological knowledge of the immature stages of the genus is still insufficient.

In this paper, morphological characters of the immature stages of *L. euryella* are described as basic taxonomic information, and they are compared with characters of *L. prunifoliella* and *L. anthemopa* in order to suggest which characters are useful for taxonomic purposes.

Materials and methods

Larvae of *Lyonetia euryella* for this study were collected mainly at Mt Mikusayama, Osaka Prefecture between December 2000 and March 2003. The larvae were reared in plastic cups for 2–4 weeks in our laboratory in nearly natural condition. Larvae and pupae for scanning electron microscopy (SEM) observation were chemically dried following Stehr (1987). For evaluating taxonomic importance, morphological characters in the immature stages of *L. euryella* are compared with those of *L. anthemopa* and *L. prunifoliella* by reference to Kuroko (1961) and Schmitt *et al.* (1996), respectively. Terminology follows Davis (1987).

Lyonetia euryella Kuroko, 1964

Mature larva (the 4th instar larva) (Figs 1E, 3)

Length 7.0–8.5 mm, width 0.8–1.0 mm. Body cylindrical, prothorax widest in living

*Corresponding author. E-mail: hirowata@plant.osakafu-u.ac.jp

NII-Electronic Library Service

The Lepidopterological Society of Japan

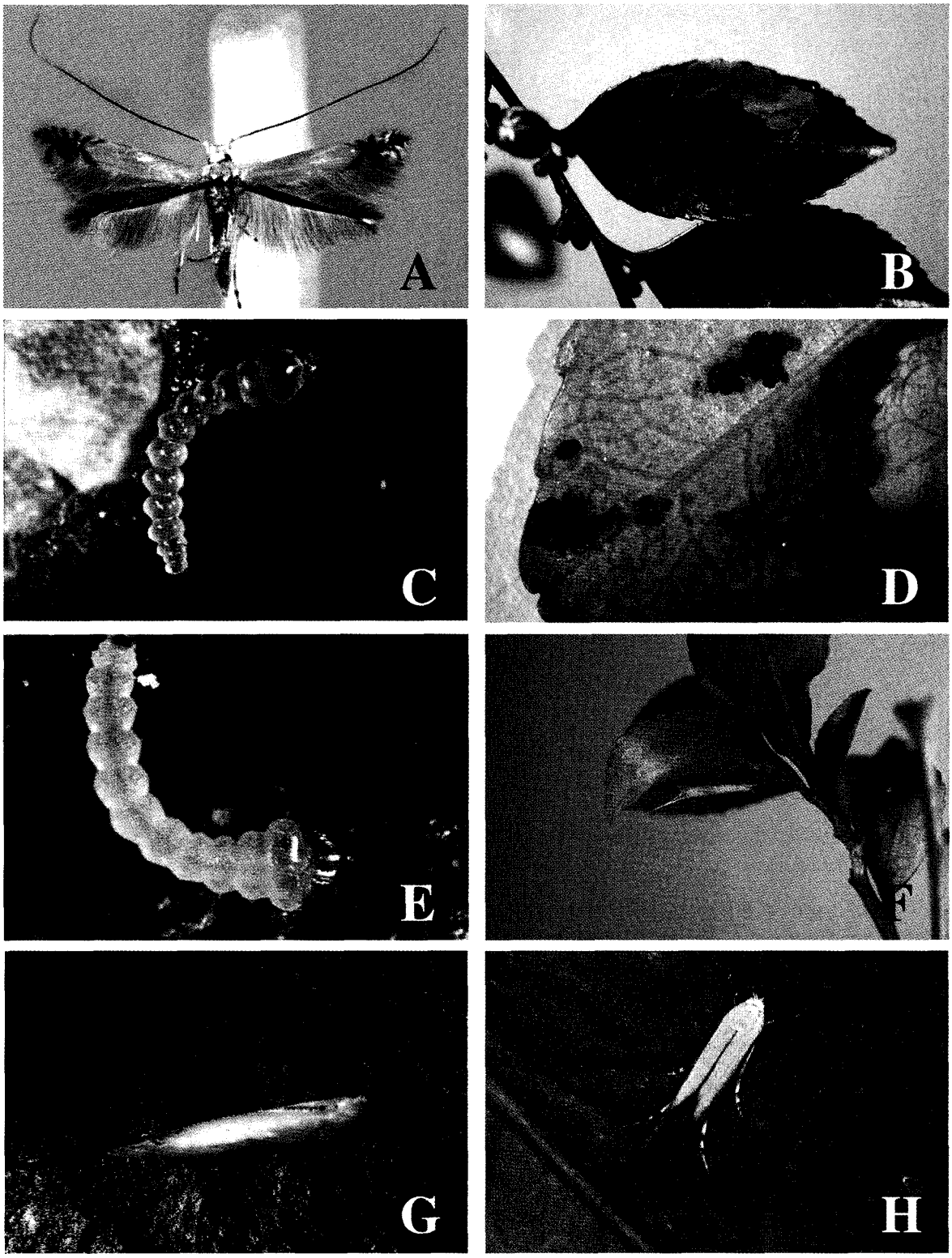

Fig. 1. Adult, mine, larva, larval frass, cocoon and pupa of *Lyonetia euryella*. A. Adult, dried speciemen. B. Larval mine on its host plant, *Eurya japonica* Thunb. (Theaceae). C. Premature larva in resting stage, took out from the mine. D. Grains of frass ejected from holes on the lower side of the mine. E. Mature larva, took out from the mine. F. Cocoon hanging on underside of the leaf. G. Pupa, took out from the cocoon. H. Resting posture of the adult.

NII-Electronic Library Service

The Lepidopterological Society of Japan

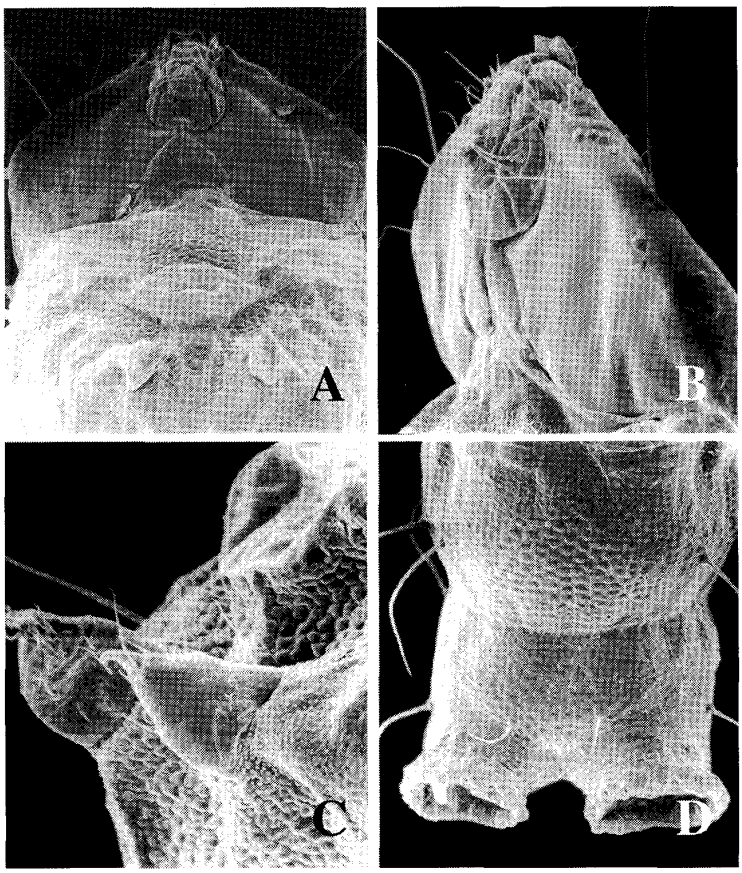

Fig. 2. Mature larva of *Lyonetia euryella*. A. Head, ventral view. B. *Ditto*, lateral view. C. T1 thoracic leg, lateral view. D. A9–10, ventral view.

material, slightly tapering posteriorly. Pale green, semitransparent, without pigmented plates nor pinacula.

Head. Maximal width about 0.6 mm. Prognathous. Whitish, semitransparent, becoming dark brown anteriorly. Rounded and depressed. Mouthparts brown. Antenna 4-segmented, reduced in size. Posterior margin V-shaped. Frontoclypeus oval. Adfrontal sclerites narrow.

Thorax. Prothoracic shield inconspicuous, unpigmented. Legs fully developed, short. Tarsal claw as shown in Fig. 2C.

Abdomen. No distinct pigmentation on the abdomen. Prolegs reduced, with uniordinal uniserial crochets on segments 3–6 and 10, arranged in transverse rows (Fig. 3B, C). A3–6 prolegs with 32–33 crochets, A10 with 13–14 crochets (Fig. 2D).

The chaetotaxy (Figs 4–5)

Head. Adfrontal setae, P2 and S3 absent. S1–2 present. S1 shorter than S2. Stemmata black, 6 pairs, separated into anterior (3rd–5th) and posterior groups (1st–2nd, 6th), anterior three (3rd–5th) contiguous and located immediately caudad to antenna, two most caudal stemmata (1st–2nd) adjacent to each other, 6th lying between 2nd and 5th, situated nearer 2nd than 5th; stemmatal region blackish, forming black lateral band from hindmost to anterior stemmata, 1st–5th located on the lateral band, 6th on ventral side, 2nd nearly the same level with 1st. Labrum with 5 pairs of setae. Mandible with four teeth (Fig. 5C).

NII-Electronic Library Service

The Lepidopterological Society of Japan

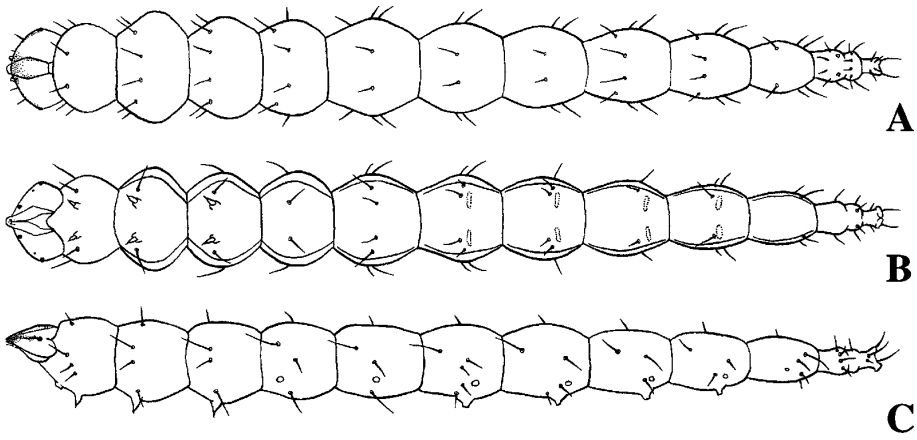

Fig. 3. Mature larva of *Lyonetia euryella*. A. Dorsal view. B. Ventral view. C. Lateral view.

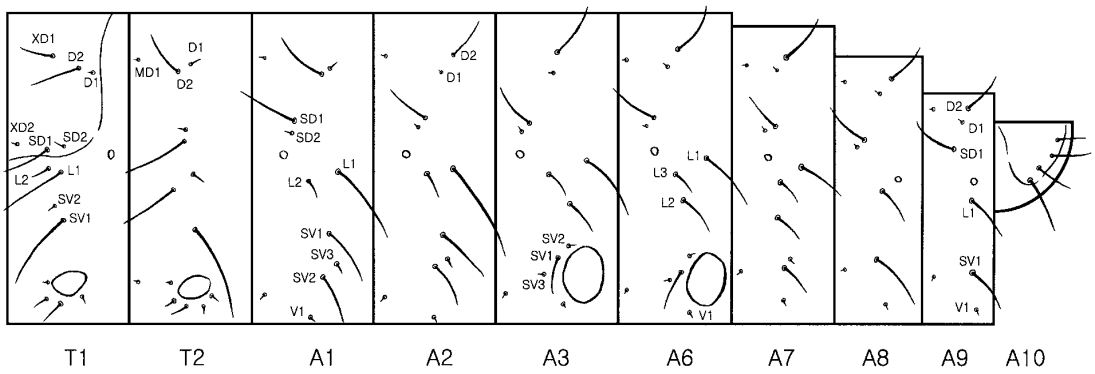

Fig. 4. Setal map of mature larva of *Lyonetia euryella*.

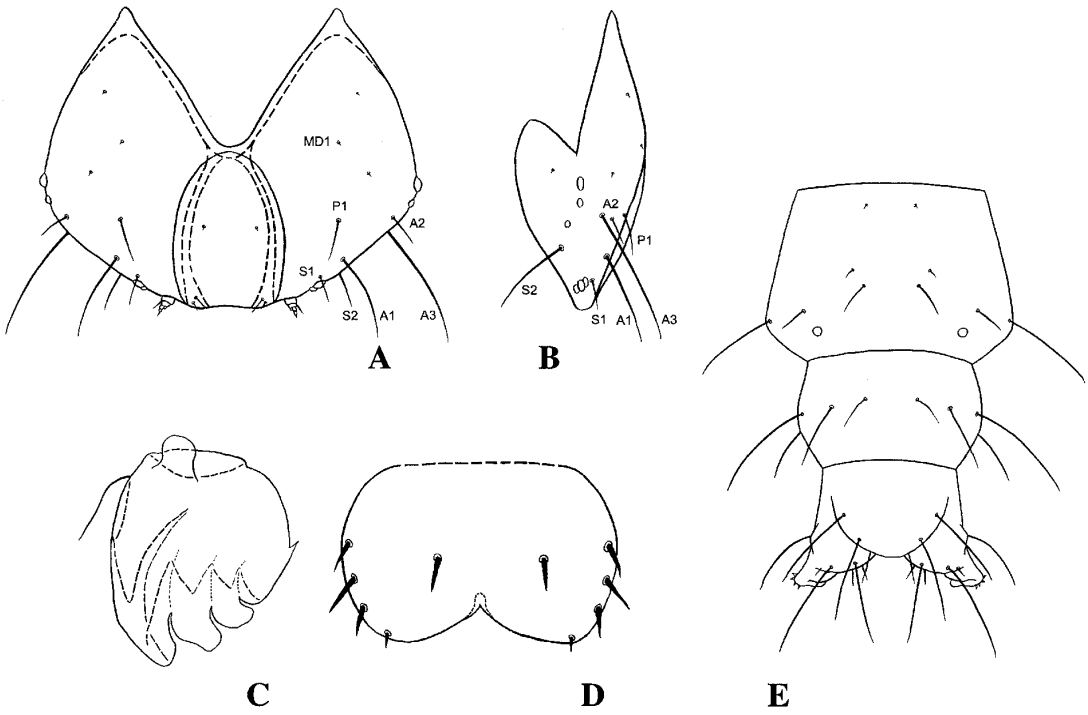

Fig. 5. Head capsule, mandible and A8–10 of mature larva of *Lyonetia euryella*. A. Dorsal view of head. B. Lateral view of head. C. Mandible. D. Dorsal view of labrum. E. Dorsal view of abdominal segments 8–10.

NII-Electronic Library Service

The Lepidopterological Society of Japan

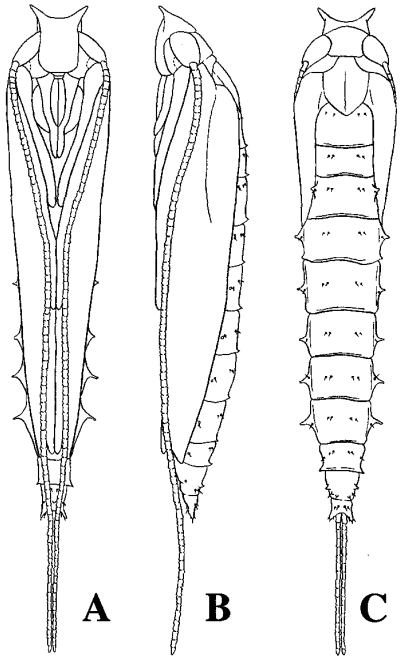

Fig. 6. Pupa of *Lyonetia euryella*. A. Ventral view. B. Lateral view. C. Dorsal view.

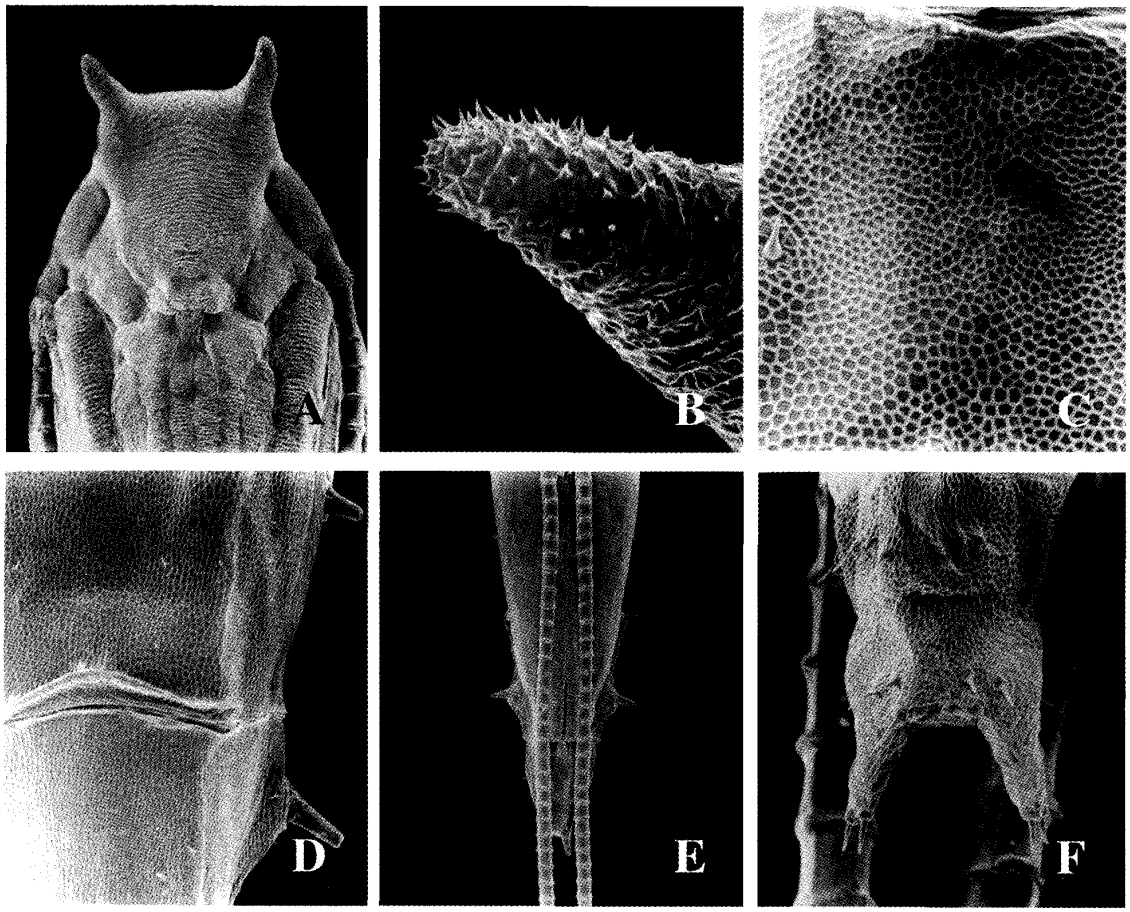

Fig. 7. Pupa of *Lyonetia euryella*. A. Head, ventral view. B. Left frontal horn, lateral view. C. Surface of 1st abdominal segment, dorsal view. D. A6–7, dorsal view. E. A5–10 ventral view. F. A9–10, dorsal view.

NII-Electronic Library Service

The Lepidopterological Society of Japan

Thorax. XD1 more dorsad than D1–2, D1 placed postero-ventrad to D2 on T1, D1 more dorsad than D2 on T2–3. SD2 minute, lateral series bisetose on T1–3. V1 and MV group absent on T1, MV2 and MV3 absent on T2–3. Subventral series bisetose on T1, unisetose on T2–3.

Abdomen. Lateral series bisetose on A1–2, trisetose on A3–7, unisetose on A8–9. Subventral series trisetose on A1–6, bisetose on A7, unisetose on A8–9. D1 short, more dorsad than D2 on A1, more ventrad than D2 on A2–9. SD2 minute and placed antero-ventrad to SD1 on A1–8, absent on A9. SV3 placed postero-ventrad to SV1, posteriorly to SV2 on A1–2, placed antero-ventrad to SV1 and SV2 on A3–6.

Cocoon (Fig. 1F)

Length about 30–45 mm. White and hammock-like.

Pupa (Figs 1G, 6–7)

Length (excluding antennae) 4.8–5.0 mm, width about 0.8–0.9 mm, height about 0.7–0.8 mm. Pale yellow green in color. Head with a pair of prominent frontal horns, projecting anteriorly beyond eyes, forming cones, rounded apically, covered with a number of minute spines (Fig. 7B). Antennal scape (Fig. 6B) enlarged, forming eye cap, length 0.8–0.9mm, width 0.2–0.3 mm. Antenna (Fig. 6) long, surpassing caudal end of abdomen 1.3 mm, 15–18 segments. Wings extending to 8th abdominal segment. Second to 7th abdominal segments with extended spiracles. Abdominal tergite smooth (Fig. 7C), reticulate. A10 terminating in bifurcate projections bearing 2 pairs of short, stout setae (Fig. 7F). The cocoon, loosely spun, hanging on lower side of the leaf (Fig. 1F).

Specimens examined. Japan, Honshu. [Larvae] 6 *exs*, Nose-cho, Osaka Pref., 30. XI. 2000 (Y. Mukai); 17 *exs*, Mt Mikusayama, Osaka Pref., 9. II. 2001 (N. H. Ahn), 5 *exs*, Mt Mikusayama, Osaka Pref., 29. III. 2003 (N. H. Ahn and T. Hirowatari). [Pupae] 5 *exs*, Mt Mikusayama, Osaka Pref., 9. II. 2001 (N. H. Ahn), 1 *ex.*, Mt Mikusayama, Osaka Pref., 9. XII. 2000 (N. H. Ahn); 1*ex.*, Kawakamimura, Nara Pref., 18. III. 2002 (T. Hirowatari and B. W. Lee).

Biology

The larva makes an irregular linear-blotch mine on the leaves of *Eurya japonica* Thunb. (Theaceae). Usually one, sometimes 2–3 mines are found on a single leaf. Second to 4th instar larvae make one to six semicircular holes on the lower side of the leaf at regular intervals, from which the larval frass is ejected, but sometimes some grains of frass are left in the mine (Kuroko, 1964, 1982). This behavior is considered to play a role in keeping the chamber clean and to controlling the humidity of the mine cavity. Adults appear from March to November at Mt Mikusayama, Osaka Prefecture.

Remarks

Although *L. euryella* is similar at first sight to *L. anthemopa* and *L. prunifoliella* on the larval and pupal characters, it is distinguishable from them by the following points: 1) Larval stemmata 6th is nearer to stemmata 2nd than 5th in *L. euryella*, whereas it lies about the middle of 2nd and 5th in *L. anthemopa* and *L. prunifoliella*, 2) Seta A2 on the larval head is present in *L. euryella*, but absent in *L. anthemopa* and *L. prunifoliella*, 3) On the larval prothorax seta D2 is located between XD1 and D1, and dorsad from D1 in *L. euryella*, but it is located postero-ventrad from D1 in *L. anthemopa* and *L. prunifoliella*, 4) On the larval

NII-Electronic Library Service

The Lepidopterological Society of Japan

meso- and metathorax, seta D1 is located dorsad from D2 in *L. euryella*, whereas it is located ventrad from D2 in *L. anthemopa* and *L. prunifoliella*, 5) Pupal frontal horns of *L. euryella* are covered with a number of minute spines, whereas frontal horns in *L. anthemopa* and *L. prunifoliella* have wrinkled surfaces, 6) Bifurcate projections on the 10th pupal abdominal segment of *L. euryella* are longer than those of *L. anthemopa* and *L. prunifoliella*.

It seems that *L. anthemopa* and *L. prunifoliella* are closely related species because the two species have several common characters but *L. euryella* is situated at a distance from the former two by differences of characters as shown in comparison of immature stages. These morphological characters may be useful not only for the identification of species, but also for inferring the phylogenetic relationships.

Acknowledgments

We wish to express our cordial thanks to Prof. M. Ishii and Mr N. Hirai of Osaka Prefecture University, for their valuable suggestions. We are also indebted to Messrs B. W. Lee, Y. Miyamoto, K. Yamada and Y. Mukai (Osaka Prefecture University) for helping us to collect materials.

References

Davis, D. R., 1987. Lyonetiidae. *In* F. W. Stehr (Ed.), *Immature Insects* **1**: 370–372. Kendall/Hunt Publ. Co., Dubuque.

Kuroko, H., 1961. A study on *Lyonetia anthemopa* Meyrick from Japan (Lepidoptera, Lyonetiidae). *Publs ent. Lab. Univ. Osaka Prefect.* **6**: 17–22.

————, 1964. Revisional studies on the family Lyonetiidae of Japan (Lepidoptera). *Esakia* **4**: 1–161.

————, 1982. Lyonetiidae. *In* Inoue, H., Sugi, S., Kuroko, H., Moriuti, S. & A. Kawabe, *Moths of Japan* **1**: 172–176; **2**: 188–189, pls 2, 230, 264–266. Kodansha, Tokyo. (In Japanese).

Nagamasu, H., 1997. Theaceae. *In* Yahiro, S. (Ed.), *Asahi Encyclopedia. The World of Plants* **7**: 130–157. Asahishinbunsha, Tokyo. (In Japanese).

Schmitt, J. J., Brown, M. W. & D. R. Davis, 1996. Taxonomy, morphology, and biology of *Lyonetia prunifoliella* (Lepidoptera: Lyonetiidae), a leafminer of apple. *Ann. ent. Soc. Am.* **89**: 334–345.

Stehr, F. W., 1987. Techniques for collecting, rearing, preserving, and studying immature insects. *In* Stehr, F. W. (Ed.), *Immature Insects* **1**: 7–18. Kendall/Hunt Publ. Co., Dubuque.

摘　　要

ヒサカキハモグリガ (鱗翅目, ハモグリガ科) の幼生期 (安　能浩・広渡俊哉・黒子　浩)

ヒサカキハモグリガ *Lyonetia euryella* の幼虫はヒサカキ (ツバキ科) の葉に線–斑状潜孔を作り, 老熟すると比較的薄く, 細長いハンモック状の繭を形成する. ハモグリガ科の幼生期の形態についてはシャリンバイハモグリガ *L. anthemopa*, リンゴハモグリガ *L. prunifoliella* の研究があるが, 分類形質としての幼生期の形態の評価は充分に行われていない. そこで, 分類学的研究の基礎資料としてヒサカキハモグリガの幼虫および蛹の形態を調査し, リンゴハモグリガ, シャリンバイハモグリガの幼生期の形態と比較した. その結果, 本種の幼虫では, 第6個眼が第2個眼と接近している, 頭部背面の adfrontal setae を欠き, A2 をもつ, 前胸の D2 は XD1 と D1 の間に位置し D1 より背面にある, 中・後胸の D1 は, D2 よりの背面に位置する, 蛹では, 頭部の突起 (角状突起) が円錐状で突起の表面に多数の小さい刺をもつ, 腹部第10節末端の2叉した突起上に2対の太くて短い刺をもつこと, などの特徴が見られた. これらの形質は, *Lyonetia* 属の種の同定だけではなく, 属内の系統を論じるのに役立つと思われる.

(Accepted February 19, 2004)

Published by the Lepidopterological Society of Japan,
5-20, Motoyokoyama 2, Hachioji, Tokyo, 192-0063 Japan

NII-Electronic Library Service